

U.S. Serial No. 10/069,321
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REMARKS

The present invention relates to lubricating oils based on base stocks having less than 99 wt% saturates content and containing one or more sulfur-phosphorus containing anti-wear/extreme pressure additives and one or more hindered phenolic antioxidants wherein it is determined that one or more of the sulfur-phosphorus containing anti-wear/extreme pressure additives is of the type which is found to interact with the hindered phenolic antioxidant to produce crystals, the lubricating oil formulation containing a quantity of di- or poly-carboxylic acid, anhydride or mixture thereof sufficient to reduce or eliminate the crystal formation which would otherwise occur in its absence.

The Examiner objected to claims 5 to 9 under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claim.

Claims 3 to 9 have been amended to change their dependencies and in so doing it is believed the improper form objection has been addressed and the error cured.

The Examiner rejected claims 1-4 and 10 (the only claims considered, claims 5-9 not being examined due to improper dependency form) under 35 U.S.C. § 103(a) as unpatentable over Robson (USP 5,972,852) or Jahnke (USP 4,118,331).

The Examiner argues that Robson teaches a lubricating oil composition comprising a synthetic oil base stock and an additive package comprising a dicarboxylic acid or anhydride, an ashless dispersant, a detergent, an anti-wear agent and an antioxidant. The Examiner points out that the anti-wear agent is a phosphorus/sulfur containing compound, and hindered phenols are specifically taught as antioxidant.

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The Examiner argues that Jahnke teaches a lubricant composition comprising an oil of lubricating viscosity, at least one carboxylic acid or its derivative and a phosphorus/sulfur compound, the base stock oil being the same as in the instant claims. The presence of an antioxidant, typically hindered phenols, is within the scope of the Jahnke invention.

The Examiner concludes that the claimed invention is prima facie obvious in view of the references because it is contended by the Examiner that the prior art prepares lubricant compositions comprising the same components as in the instant claims, and any benefit resulting from the combination of those components would be there, regardless of whether recognized by patentees or not.

Applicant respectfully traverses this rejection.

The present invention is not merely drawn to a lube oil formulation comprising a base oil of less than 99 wt% saturates content, and containing just any sulfur-phosphorus containing anti-wear/extreme pressure additive, a hindered phenolic antioxidant and a high molecular weight di- or poly-carboxylic acid, anhydride or mixture thereof.

The present invention, rather, is drawn to the suppression of crystal formation in formulations in which the sulfur phosphorus containing anti-wear/extreme pressure additive and the hindered phenol antioxidant interact to form crystals. Not all, nor do even most, of the known sulfur phosphorus containing antiwear/extreme pressure interact with hindered phenols to generate crystals.

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The only way for the practitioner to know if there is or will be crystal formation as a result of mixing a sulfur-phosphorus containing anti-wear/extreme pressure additive with a hindered phenol antioxidant is to actually mix the two and see if crystals form.

Merely because in the reference cited the formulation contains base stock and sulfur phosphoric containing anti-wear/extreme pressure additives and hindered phenols does not necessarily mean that such formation would necessarily contain crystals or be prone to crystal formation which would be suppressed by the presence of high molecular weight di- or poly-carboxylic acid, anhydride or mixtures thereof.

The mere recitation in the references of formulations containing a broad recitation of components corresponding in name to the chemical types of materials recited in the present claim does not mean that those references actually formulated compositions corresponding to the lubricant of the present invention or that the formulations in fact reflected or benefit from a suppression of crystal formation.

Because only some but not all sulfur-phosphorus containing anti-wear/extreme pressure additive form crystals when mixed with hindered phenol antioxidants and the identification of which of them do can only be determined by actually preparing such mixtures, the references cited do not teach, suggest or imply formulations which necessarily in fact possess the benefit of crystal formation suppression, nor can it be inferred that the formulations of the references inherently practice the suppression of crystal formation by the presence in the formulation of high molecular weight di- or poly-carboxylic acid, anhydride or mixtures thereof in addition to the hindered phenol antioxidant and the sulfur-phosphorus containing anti-wear/extreme pressure additives.

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Robson (USP 5,972,852) describes formulations comprising synthetic base stock such as PAO, and containing hydrocarbyl substituted dicarboxylic acids or anhydrides (Mn of hydrocarbyl group 700-5000), a viscosity modifier, and anti-wear agents identified as dihydrocarbyl dithiophosphate salts (column 7, line 40 - column 8, line 23). No other sulfur-phosphorus containing anti-wear/extreme pressure additive appears to be mentioned, described or suggested.

In the present application at page 7, it is expressly stated that:

"It must be noted that for the purposes of the present invention metal dihydrocarbyl dithiophosphate (metal DDP) or ashless DDP do not fall within the above definition of sulfur-phosphorus containing anti-wear/extreme pressure additive because it has been found that they do not form crystals when combined with hindered phenols in base oil."
(emphasis added)

Thus, the only type of sulfur-phosphorus containing anti-wear/extreme pressure additive mentioned in Robson is precisely the type expressly excluded from being within the scope of the present invention.

Consequently, it must be recognized that Robson cannot be deemed as teaching, suggesting or implying the present formulation or process nor to be teaching formulations which inherently embody or experience the benefits disclosed in the present invention.

Robson should be deemed not relevant with respect to the present invention.

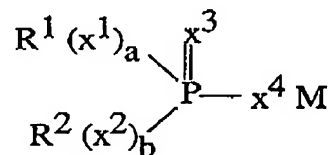
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Jahnke (USP 4,118,331) is directed to metal working lubricants comprising base oil of lubricating viscosity, a carboxylic acid or derivative thereof and a phosphorus acid salt, usually a zinc salt of a phosphorodithioic acid. Such phosphorus acid salts are described in detail at column 1, line 15-27 and column 5, lines 10-42.

The presence of other additives such as hindered phenol and oxidants is suggested, BUT none of the examples appear to contain any such hindered phenolic antioxidant. Consequently, Jahnke could not have practiced the present invention.

Merely because Jahnke describes in broad terms a formulation containing ordinary base oil of lubricating viscosity including natural and synthetic oils in combination with at least one carboxylic acid or derivative thereof, including anhydrides and esters, salts, or amides, phosphorus and salts of the formula:



wherein M is a Group I metal, a Group II metal, aluminum, tin, cobalt, lead, molybdenum, manganese, nickel or ammonium, each of R¹ and R² is a hydrocarbon-based radical, each of x¹, x², x³ and x⁴ is oxygen or sulfur and each of a and b is zero or 1, and antioxidants, typically hindered phenols, does not constitute an actual teaching or suggestion of the present invention.

In the present invention it is not sufficient that the formulation simply contain a base oil of less than 99% solution content, a hindered phenol antioxidant, a carboxylic acid and a sulfur-phosphorus containing anti-wear/extreme pressure additive.

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The present invention teaches crystal formation suppression or elimination and formulations in which crystal formation is suppressed or eliminated. The formulations of the present invention are specifically the formulation containing sulfur phosphorus anti-wear/extreme pressure additives which are found to reach with hindered phenol antioxidant to create or yield crystals and which would have crystals but for the presence of the 0.0013 wt% high molecular weight di- or poly-carboxylic acid, anhydride or mixture thereof for each 1 ppm phosphorus attributable to the sulfur-phosphorus containing anti-wear/extreme pressure agent as taught in the present invention specification.

The Jahnke reference does not teach that its sulfur-phosphorus additive reacts with hindered phenol anti-oxidant to form crystals, nor can it be determined from the Jahnke text whether those sulfur-phosphorus additives can or will react with hindered phenol anti-oxidants to actually form crystals.

Conversely in the present invention it is specifically recited and taught that for those sulfur-phosphorus anti-wear/extreme pressure additive which are found to react with hindered phenol to form crystals, such crystal formation can be suppressed or eliminated by the use of 0.0013 wt% high molecular weight di- or poly-carboxylic acid, anhydride or mixture thereof for each 1 ppm phosphorus attributable to the sulfur-phosphorus containing additive.

Jahnke does not teach that such crystals can form nor does it teach a method for suppressing such crystal formation, nor does it teach, suggest or imply formulations that would contain such crystals but for the presence in the formulation of the di- or poly-carboxylic acid, anhydride or mixtures thereof.

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The present invention is specifically directed to formulations containing those sulfur phosphorus containing anti-wear/extreme pressure agent which are found by the practitioner to interact with hindered phenol anti-oxidant to form crystals and which would contain such crystals but for the additive to a the formulation of di- or poly-carboxylic acid, anhydride or mixture thereof a taught in the present specification.

Neither Robson nor Jahnke actually teach such a specific formulation nor do either actually practice or produce formulations containing base oil and hindered phenol and sulfur-phosphorus agent and carboxylic acid.

The Examples of Robson contain PAO, an unspecified anti-oxidant and an unspecified anti-wear agent. Based on the teaching of the text, it must be presumed that the anti-wear agent is the only one described in the text which is a ZDDP type (columns 7/8). As has been previously indicated, this type of sulfur-phosphorus anti-wear/extreme pressure agent is of the type which DOES NOT form crystals when combined with hindered phenol, anti-oxidant.

Thus, Robson does not suggest the present invention nor does it actually produce a formulation corresponding to the present invention.

Jahnke's examples contain mineral oil, tetra-propenyl succinic anhydride or polyisobutene substituted succinic anhydride or lithium salt of PIB substituted succinic anhydride and zinc salt of mixed isobutyl-primary amyl phosphorodithioic acid or zinc salt of tetrapropenyl phenyl phosphorodithioic acid. None of the formulations contained any hindered phenol antioxidant.

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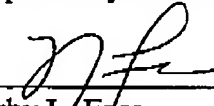
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Thus Jahnke does not suggest the present invention of crystal formation suppression nor does it actually practice formulations corresponding to the present invention.

It is not possible for the formulations actually produced by either Robson or Jahnke to have inherently benefited from the percussion suppression or elimination of any crystal formation as taught in the present invention.

It is requested that the Examiner consider the amendments made to the claims, the new claims, and the arguments and comments herein presented, that she withdraw the rejections, allow the claims, and pass the case to issue in due course.

Respectfully submitted,



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☒ Pursuant to 37 CFR 1.34(a)

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